LAMBDA ELECTRONICS CORP.

INSTRUCTION MANUAL FOR

REGULATED POWER SUPPLY MODEL 71

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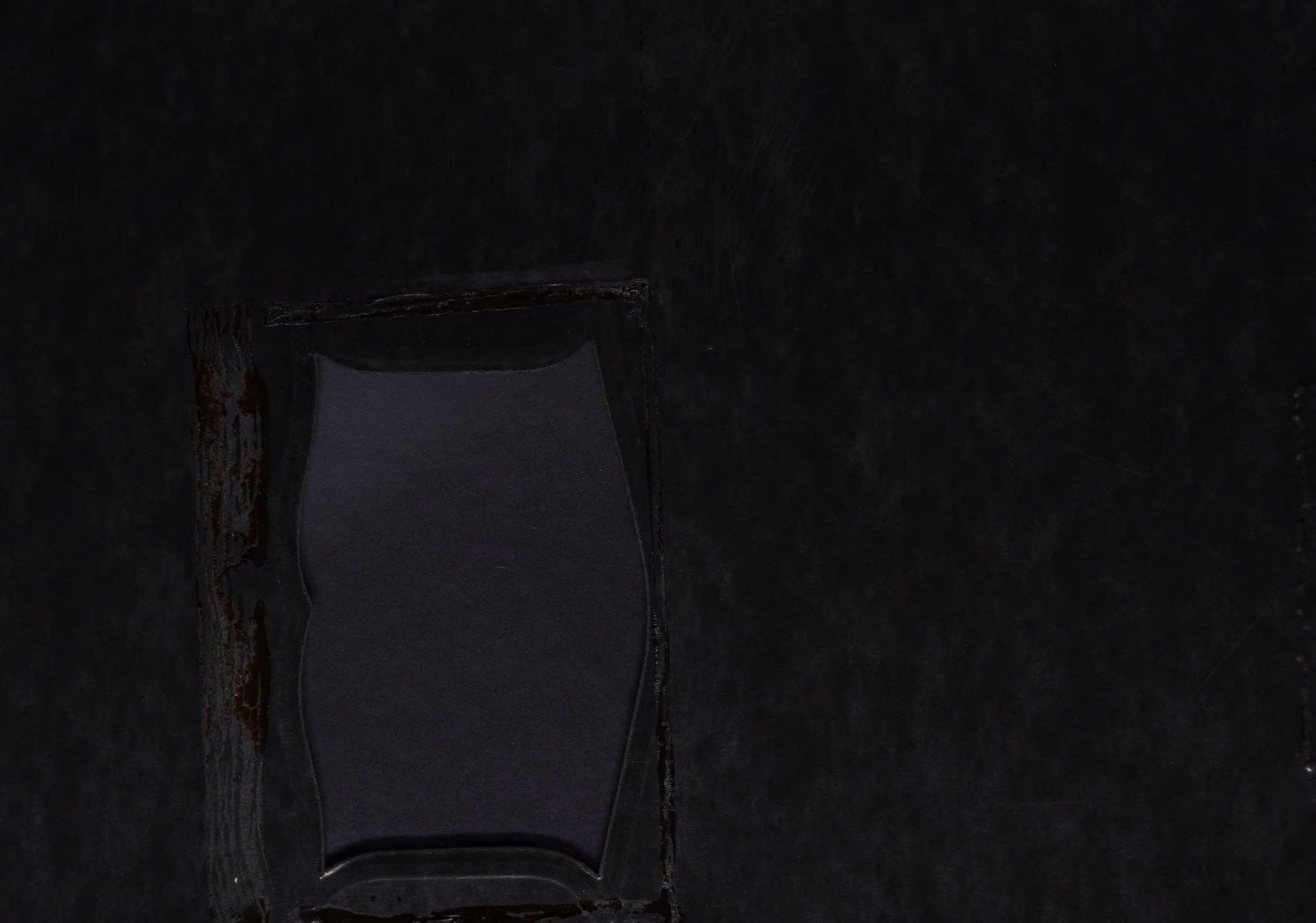
Western Electric Company

ENGINEERING RESEARCH CENTER



LAMBDA ELECTRONICS CORP.

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INSTRUCTION MANUAL

LAMBDA

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REGULATED POWER SUPPLY

MODEL 71

THIS MANUAL APPLIES TO UNITS
BEARING SERIAL NUMBER PREFIXED A & B

LAMBDA ELECTRONICS CORP. HUNTINGTON, NEW YORK

IM-71-C

INSTRUCTION MANUAL

FOR

REGULATED POWER SUPPLY

MODEL 71

1. GENERAL DESCRIPTION

1. GENERAL DESCRIPTION.

The Model 71 Power Supply described in this manual is designed for general purpose use in industry, laboratory, radio station and school to supply power to electronic and other equipment. The DC output voltages are electronically regulated, are practically independent of normal line voltage fluctuations and substantially free from hum and noise. The high voltage DC output is constant (within the specified limits) from zero to maximum load and features a continuously variable voltage-control with an auxiliary vernier-control from precise voltage adjustment. The DC bias-voltage output is also continuously adjustable and is closely regulated for line voltage variations. The following output voltages are supplied:

Output #1: 0-500 VDC, 0-200 MA, regulated.

Output #2: 0-200 VDC, 0-50 VDC, bias output. Regulated for line voltage variation.

Output #3: 6.5 VAC, 5A, unregulated.

Output #4: 6.5 VAC, 5A, unregulated.

The easy to read 3-1/2" panel meters permit monitoring of output voltage and current. Magnetic circuit-breakers provide convenient AC and DC overload protection. A time-delay relay circuit protects the tubes during the initial warm-up period. Sturdy, insulated binding-posts are provided for front panel connections. A 5651 voltage reference tube insures long time stability for operation. Quality components, conservatively rated, guarantee long, dependable trouble-free service.

INSTRUCTION MANUAL

FOR

REGULATED POWER SUPPLY

MODEL Y1

1. GENERAL DESCRIPTION.

2. ELECTRICAL SPECIFICATIONS:

Input: 105-125 VAC, 50-60 CPS, 475 W (max)

DC Output No. 1: (regulated for line and load)

Voltage: 0-500 VDC (continuously variable)

Current: 0-200 MA (over entire voltage range)

Regulation (line): 0.15% or 0.3 volt (whichever is greater)

Regulation (load): 0.15% or 0.3 volt (whichever is greater)

Internal Impedance: Less than 4 ohms

Ripple and Noise: Less than 5 millivolts rms

Polarity: Either positive or negative terminal may be grounded.

DC Output No.2: (regulated for line only)

Voltage Ranges:	Internal Resistance:
a) 0-50 VDC (no load)	5,500 ohms
b) 0-200 VDC (no load)	25,000 ohms

Current Range:

Any value of external load impedance may be used including a continuously applied low impedance or short-circuit. Insignificant interaction on Output No.1.
Short Circuit Current: 9 MA (max.)

Regulation (line): Better than 0.1%

Ripple and Noise: Less than 5 millivolts rms.

Polarity: Positive terminal connected internally to negative terminal of DC Output No.1.

AC Outputs (unregulated):

Two outputs, isolated and ungrounded. Each is 6.5VAC at 5A (at 115 VAC input). Allows for drop in connecting leads. May be connected in series for 13.0 VAC (nominal) at 5A, or in parallel for 6.5 VAC (nominal) at 10A.

Ambient Temperature and Duty Cycle:

Continuous duty at full load up to 40°C (104°F) ambient.

Overload Protection:

External overload protection	AC and DC systems utilize magnetic circuit breakers. Trip-Free. Instant manual reset. Front panel.
Internal Failure Protection	Fuses, access through rear of cabinet.

Input and Output Connections:

Input	8-foot heavy duty rubber covered line cord with integral molded plug, rear of cabinet.
Output	Sturdy insulated "5-way" binding posts, front panel.

Meters:

Output Voltage	Multi-range 3-1/2" rectangular voltmeter calibrated 0-50 VDC, 0-200 VDC, 0-500 VDC.
Output Current	3-1/2" rectangular milliammeter calibrated 0-200 MA.

Voltage Reference Tube:

A stable 5651 reference tube is used to obtain superior long-time voltage stability.

Time-Delay Relay Circuit:

A 30 second time delay circuit is provided to allow tube heaters to come to proper operating temperature before high voltage can be applied.

TUBE COMPLEMENT:

Tube Type	Quantity	Function
5R4-GYA	1	Rectifier
6X4	1	Rectifier
6W6-GT	6	Control Tubes
6N030	1	Time Delay Relay
12AX7A	3	Voltage Amplifier
5651	1	Voltage Reference
OA2	1	Voltage Stabilizer

3. MECHANICAL SPECIFICATIONS:

Size and Weight and Finish

Size	13" H x 8-3/4" W x 14-1/2" D
Weight	49 lbs.
Finish	Two-tone gray

II. OPERATING INSTRUCTIONS

MODEL 71

1. OPERATING CONTROLS.

a) The "AC" circuit-breaker is in series with the AC line and controls power to the supply. When the toggle of the "AC" breaker is in the "ON" position, the adjacent pilot-light indicator marked "AC" is illuminated, the heaters of all the tubes in the supply are energized, and a thirty-second protective thermal time-delay relay is set into operation.

b) The "DC" circuit-breaker contacts are in series with the plate power relay and controls the application of plate voltage to the rectifiers of the high-voltage DC and bias supplies. The "DC" circuit breaker is interlocked with the thermal time-delay relay so that the delay cycle is completed after the tube heaters reach operating temperature. After the delay cycle is completed the "DC" breaker, when thrown to the "DC-ON" position, will apply "DC" power, and the adjacent pilot-light indicator will be illuminated. The "DC" breaker may then be used in normal switch fashion to turn DC power on and off without delay.

c) The "VOLTMETER" toggle-switch connects the "OUTPUT VOLTAGE" meter to either the "HV" output or the "BIAS" output circuits so that either voltage can be monitored as desired. The voltmeter circuit is designed so that switching from bias to high-voltage reading will disturb neither output voltage.

d) The "HV" control consists of a variable transformer and a precision wirewound potentiometer ganged together, and permits the high voltage DC output to be set at any value from 0 to 500 VDC. The calibration of this control indicates the value of the DC output-voltage and permits presetting of the "HV" control before the "DC" breaker is turned on. It also provides an indication of the high-voltage DC output when the "OUTPUT VOLTAGE" meter is used to monitor the bias output voltage.

e) The "ΔHV" control is a wirewound potentiometer permitting vernier control of the high voltage DC output for precise voltage adjustment. It has a range of plus or minus 5 volts and a calibration accuracy of 5%.

f) The "BIAS RANGE" toggle switch provides two ranges of bias output voltage, 0-50 or 0-200 volts DC.

g) The "BIAS" control is a wirewound potentiometer which permits the bias output voltage to be set to any value from zero to the maximum output voltage of either bias voltage range.

h) The "OUTPUT VOLTAGE" meter is a 3-1/2" panel instrument which indicates either the "HV" output or "BIAS" voltage output depending upon the position of the "VOLTMETER" toggle switch. In the "HV" position it reads 0-500 VDC full scale (black numerals). In the "BIAS" position it reads either 0-200 VDC or 0-50 VDC (red numerals) depending upon the position of the "BIAS RANGE" switch.

i) The "OUTPUT CURRENT" meter is a 3-1/2" panel instrument in series with the "HV" output and indicates the external load current of the high-voltage DC output only.

2. OUTPUT TERMINALS.

a) FRONT PANEL TERMINALS:

The output terminals are sturdy insulated "captive-head" binding-posts which can be used in a number of ways and are sufficiently sturdy to take a substantial amount of handling and abuse. They will accept "wrap-around" wire connections, "alligator clips", banana plugs, spade lugs, and wire as large as #12 AWG for permanent feed-through clamping. The "HV" "BIAS" and each of the "6.5 VAC" output terminal-pairs are spaced on 3/4" centers so that they will accept standard double banana plugs.

b) "HV" OUTPUT CONNECTIONS:

The regulated high-Voltage DC output is available at the front panel terminals marked "HV".

The positive connection is brought out through the red binding post marked "+". The negative connection is brought out through the black binding post marked "-".

In most applications, it is usual for the negative terminal to be at ground potential. In some cases, it may be desired to place the positive terminal at ground potential. Still other applications may require that neither positive nor negative terminal be at ground potential. In such cases where either the positive or negative terminal is to be at ground potential, the appropriate terminal on the panel should be connected by means of a jumper wire to the binding post, marked "INT GND".

For minimum output ripple, it is recommended that either the positive or negative high voltage DC output terminal be grounded.

c) "BIAS" OUTPUT CONNECTIONS:

The regulated DC bias-output voltage is available at the front panel terminals marked "BIAS". The positive "BIAS" connection is internally tied to the negative "HV" connection and is brought out through the black binding post marked "BIAS+" and "HV-". The negative "BIAS" connection is brought out through the black binding post marked "BIAS-".

d) AC OUTPUT CONNECTIONS:

The AC output connections marked "6.5 VAC 5A" provide two independent sources of unregulated voltage for vacuum-tube heater-circuits. Both output sources are available at the front-panel binding-posts. The AC output terminals may be connected in series to provide 13.0 VAC at 5 amperes, or in parallel to provide 6.5 VAC at 10 amperes. The schematic diagram on the panel below the AC output binding posts shows the proper connections of the terminals for correct "phasing" of these voltages.

SAFETY NOTICE

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3. PLACING MODEL 71 INTO OPERATION.

a) Both the "AC" and "DC" circuit-breakers should be in the "OFF" position. The "HV" control and the "BIAS" control should be in their extreme counter clockwise positions, the "ΔHV" control in the center or "0" position.

b) Plug the power cord into a source of 115 volts AC 50/60 cycles.

c) Connect the desired AC and DC loads to the output terminals of the supply. Note the schematic diagram on the front panel showing proper phasing of the 6.5 VAC outputs for series or parallel operation.

d) Throw the "AC" circuit breaker to the "ON" position. The AC pilot indicator marked "AC" will be illuminated, and 6.5 volts AC will be present at the front panel binding-posts. The thermal time-delay circuits will start its 30-second delay-cycle.

e) After approximately 30 seconds, throw the "DC" circuit-breaker to the "ON" position. The pilot-light indicator marked "DC" will be illuminated, and the internal plate-power-relay will close. If the "DC" circuit breaker is thrown to the "ON" position before the 30 second time delay has elapsed, the pilot indicator will not light nor will the plate-power-relay close until the time-delay cycle is complete.

f) After the pilot "DC" indicator is illuminated throw the "VOLTMETER" selector switch to the "HV" position. Turn the "HV" control clockwise to the desired DC output voltage as indicated on the "OUTPUT VOLTAGE" voltmeter. The "ΔHV" vernier control may be utilized for precise voltage adjustment. If an external load is connected to the "HV" output terminals, the output current will be indicated on the "OUTPUT CURRENT" meter.

g) If use of the "BIAS" output voltage is desired, throw the "DC" breaker off, connect the bias-load to the "BIAS" terminals, set the "BIAS RANGE" switch to the bias voltage range desired, the "VOLTMETER" selector switch to "BIAS" and the "BIAS" control to zero. Throw the "DC" breaker on. Turn the "BIAS" control clockwise to the required voltage as indicated on the proper red scale of the "OUTPUT VOLTAGE" meter. The "OUTPUT VOLTAGE" meter may be used to monitor the bias voltage, the calibration on the "HV" control then serving as an indication of the "HV" output voltage.

h) If it is desired to turn off the DC output only, use the "DC" circuit breaker, leaving the "AC" breaker in the "ON" position. In this manner, the supply will be in a stand-by condition ready for instant use.

CAUTION: Turning the supply on and off rapidly by means of the "AC" breaker (with the DC breaker in the "ON" position) may seriously damage or impair the life of the high voltage rectifier tube. If less than one minute elapses between the time the "AC" breaker is turned off and turned on again (the time required for the protective thermal time-delay relay to re-cycle) the "DC" breaker should be kept in the "OFF" position for at least 20 seconds after the "AC" breaker is turned on to permit the rectifier heaters to return to proper operating temperature.

4. OVERLOAD-PROTECTION.

a) AC OUTPUT-CIRCUITS:

An overload or short circuit of the 6.5 VAC 5A output circuits will trip the "AC" circuit breaker shutting off the entire supply. Removing the over-load and turning

the "AC" breaker on again will restore operation. If the supply is off for more than one minute the thermal delay-relay may re-cycle before DC voltage will be present at the output terminals. (see CAUTION note in Paragraph 3 above).

b) HIGH VOLTAGE DC OUTPUT CIRCUITS:

An overload or short circuit of the "HV" output will trip the "DC" circuit-breaker releasing the plate-power-relay and disconnecting the plate-voltage from the rectifier tubes of both the high-voltage DC and bias supplies. Removing the overload or short-circuit and throwing the "DC" breaker to the "ON" position will restore operation immediately.

c) DC BIAS OUTPUT CIRCUIT:

The bias output circuit is so designed that it may be short-circuited for indefinitely long periods of time without damage to any component or effect on the high voltage DC output.

5. INTERNAL POWER SUPPLY FAILURE PROTECTION:

a) In general, external overload of the output voltage circuits will result in tripping of the circuit breakers. Internal failure of the power supply components may result in tripping of the breakers or blowing of the internal protective fuses mounted at the rear of the unit. Failure of F1, the 1/2 ampere 3AG "Slo-Blo" fuse, indicates failure of a component of the bias reference supply. Failure of this fuse will probably require servicing of the power supply. Refer to Section III for maintenance data before servicing of equipment or replacement of the fuse.

NOTE: Failure of this fuse will result in removal of voltage from all DC output terminals.

b) F2, a 10 ampere 3AG "Slo-Blo" input line fuse located adjacent to F1 provides protection against failure of the powerstat TA-1, Lambda Part No. ACR-13-033, and input wiring. This fuse will also protect the power supply in event that the unit is accidentally plugged into a 220 VAC circuit or into a DC circuit. This fuse will not open in the case of overloads of the DC or AC output circuits. This protection is provided by the circuit breakers.

6. NOISE AND RIPPLE OUTPUT:

The noise and ripple output of the high-voltage DC supply should be less than 5 millivolts rms and the DC bias supply less than 5 millivolts rms at all voltages and load conditions within the specifications. Measurement of this level of voltage may be made with an AC VTVM capable of reading 5-8 millivolts rms. Measurements of these low values of voltage should be made using a shielded cable connecting the power supply output to the AC VTVM.

It is recommended that either the positive or negative terminal of the "HV" output be connected by a jumper wire to the "INT GND" terminal for minimum ripple output.

7. INTERNAL IMPEDANCE:

a) "HV" OUTPUT:

The internal impedance of the high voltage DC supply is approximately 4 ohms for DC. A 2 mfd oil-filled paper capacitor is in shunt with the DC output circuit for two purposes: 1) to maintain this low value of output impedance at audio, and at low and medium radio frequencies, 2) to provide a reservoir to supply transient currents of short duration having peak values greater than 200 MA.

An additional external capacitor shunted across the "HV" output will provide even lower AC output impedance and allow even higher peak transient currents to be drawn. For low impedance to high frequency RF currents, the common practice is to use a mica capacitor shunt close to the RF unit.

b) DC BIAS OUTPUT:

The internal resistance of the DC bias supply 0-200 VDC range is approximately 25,000 ohms. For low impedance to AC, an external capacitor should be shunted across the "BIAS OUTPUT" terminals. For low impedance to high-frequency RF currents, the common practice is to use a mica capacitor shunt close to the RF unit. The internal resistance of the bias supply 0-50 VDC range is 5,500 ohms.

III. MAINTENANCE

SAFETY NOTICE

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1. GENERAL.

Under normal conditions no special maintenance of the Model 71 Regulated Power Supply is required except for occasional tube replacement. In the event of failure, or inability of the regulated DC output circuits to function properly a list of typical symptoms and their probable causes is given in Paragraph "6" of this section.

2. REMOVAL OF POWER SUPPLY UNIT FROM CABINET.

If tube replacement or servicing of the unit is necessitated, the power supply unit must be removed from its cabinet. This is accomplished by removing the four large diameter nickel-plated screws on the rear face of the cabinet and sliding the unit out.

NOTE: It is not necessary to loosen any screws other than the four mentioned above for removal of the supply from the cabinet. At no time should removal of the painted screws in the rear of the cabinet be attempted.

3. SERVICING OF POWER SUPPLY WHEN REMOVED FROM CABINET.

a) Upon removal of the cabinet, all tubes are made accessible, and tube replacement is simply accomplished. 6W6-GT tubes and the 6N030 tube are secured to their sockets by means of spring-type retainer clamps. These retaining clamps must be depressed into and held in a flattened position before removing these tubes. When replacing the miniature type tubes, they should be inserted into a pin straightener before putting them into the sockets to avoid bending pins. Bent pins create strain on the glass bases with the resulting possibility of breakage or cracking in time. When tubes are replaced, adjustment of calibrating potentiometers should be checked.

b) 6N030 TIME-DELAY-RELAY:

The 6N030 is most readily checked under actual operating conditions. If the Power Supply is turned on from a cold start, and the "DC" circuit-breaker left in the "ON" position, the internal plate-power-relay will close with an audible click, and the "DC ON" pilot light indicator will be illuminated within 30 to 45 seconds.

At high AC line-voltages, the relay may close in as early as 20 seconds, at low line-voltages as late as 1 minute. If the plate-power-relay closes much earlier than 20 seconds or later than 1 minute from a cold start, the 6N030 should be replaced.

c) 0A2 VOLTAGE REGULATOR TUBE:

Upon placing the Model 71 Power Supply into an operating condition at any setting of output voltage the 0A2 should exhibit an internal pale purple glow. If tube fails to glow or appears to flicker, the tube should be replaced. If the new tube does not operate properly, the circuit voltages should be checked against the circuit diagram.

d) 5651 VOLTAGE REFERENCE TUBE:

No special check of the 5651 tube is required. The tube operates normally with a bright orange glow on the surface of its disc-shaped cathode. If the tube fails to glow or appears to flicker, it should be replaced. If then the fault is not removed, a voltage check should be made of the tube and its associated circuits. The voltage across the 5651 should range between 82 and 92 VDC and should not fluctuate.

4. ADJUSTMENT OF CALIBRATING POTENTIOMETERS R35 &R36.

If any of the tubes other than the rectifiers, (5R4-GYA and 6X4), the series control tubes, (6W6-GT), and the time-delay-relay, (6N030), are replaced, the calibrating and alignment potentiometers, R35 and R36, may require readjustment. This readjustment should be made according to the following procedure:

a) With AC and DC circuit breakers in the "OFF" position, zero-set the "Output Voltage" and "Output Current" meters accurately.

b) Turn the "HV" control to its extreme clockwise position. The pointer on the control knob should line up with the 500 volt calibration line or very close to it.

If a major discrepancy exists, loosening of the two set screws in the knob will permit readjustment of its position,

c) Set the "ΔHV" control to its center or "0" position.

d) Set the "Voltmeter" switch to the 'HV' position.

e) With no external AC or DC load on the Power Supply, turn both "AC" and "DC" circuit breakers on and allow the supply to warm up for at least 10 minutes.

f) With the "HV" control set to 500, adjust R36 so that the 'Output Voltage' voltmeter reads 500 volts (black scale.)

g) Turn the 'HV" control to the zero mark. Adjust R35 so that the "Output Voltage" voltmeter reads zero.

h) Repeat steps "f" and "g" until the "HV" control reads zero in its extreme counter clockwise position and 500 volts in its extreme clockwise position.

5. OPERATIONAL CHECK.

a) REGULATION WITH LOAD:

After tubes have been replaced or the equipment serviced, a simple check of the proper operation of the 0-500 VDC output circuit supply may be made by alternately connecting and disconnecting a 200 MA load to the supply with the "Output Voltage" meter in the "HV" position. Except for a transient kick of the meter needle when the load is connected to the supply, the change in output voltage should be barely perceptable (Less than 1/10 of 1 division on the meter scale) for proper operation. An AC VTVM capable of reading 5 millivolts rms may be employed to check the noise and ripple level output of the supply when making this check. Shielded leads should be employed to connect the AC VTVM to the Power Supply output terminals.

Note that the "DC" "BIAS OUTPUT" circuit is not regulated for load variations. (see Electrical Specifications.)

b) REGULATION WITH LINE:

A Variac or Powerstat connected between the AC power line and the input to the Model 71 may be employed to check the regulation of the DC output circuits. With the "Output Voltage" voltmeter in the circuit being monitored and the line voltage varied from 105 to 125 VAC, the change in output voltage should be barely perceptible (less than 1/10 of 1 meter division) for proper operation.

6. TYPICAL POWER SUPPLY FAILURE CONDITIONS AND THEIR POSSIBLE CAUSES.

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Refer to the Schematic Diagram for proper operating voltages in the equipment.

It is recommended that the input plug be removed from the 115 VAC source when removing or replacing tubes.

OPERATING CONDITION	REMEDY OR SOLUTION
a) AC circuit breaker trips repeatedly	Check AC output for overload or short circuit. Remove overload condition.
b) DC circuit breaker trips repeatedly	1) Check "HV" output load circuit for overload or short circuit. Remove overload condition. 2) If this does not eliminate tripping of the DC breaker, then check for faulty 5R4-GYA tube. This tube should be tested in a tube checker. If found faulty, it should be replaced. 3) If tube is found to be good or if replacement by a new tube does not eliminate breaker tripping, check capacitors, C1 and C2A for breakdown or short circuit. If these are found to be cause of breaker tripping, replacement of these capacitors is required.
c) Presence of high DC positive voltage at terminals compared to that indicated on "HV" dial, along with high ripple and poor regulation. (No external load is applied to "HV" output).	1) Shorted 6W6-GT tubes. V2 through V6. Shorting of tube elements within tube envelope will result in loss of control. A visual inspection of the individual tubes may lead to identification of faulty tube. If this is not the case, each tube individually should be removed while the output voltage is monitored on the "Output Voltage" meter.

If upon removal of any tube V2-V6, this condition is eliminated, replace this faulty tube with a new tube.

2) Filament burnout of 12AX7A, V8. If tubes V2-V6 are all found to be good, the 12AX7A, V8 may have a burned out filament. This is simply checked for by replacing the 12AX7A with a new tube.

3) Lose of bias supply voltage will result in rise of output voltage. If bias supply output voltage approaches zero volts, and 5651, V14 is extinguished and voltage across C5A is zero, the bias supply system fuse, F1, 1/2 A has failed. Insert a 1 ampere AC ammeter in place of the fuse and turn on the supply. If current exceeds 0.4 amperes check 6X4, V10 for short or gassy condition, and C5A, C5B for shorted capacitors. If any of these components are found to be faulty, replace these components.

4) Absence of voltage across filter capacitors C5A, C5B. Check V10, 6X4 tube for open or burned out filament. This is most simply accomplished by replacing tube with a new tube.

5) Presence of bias supply input filter voltage and absence of supply output voltage.
   a) 6W6-GT, V1 filament is burned out, replace tube.
   b) Filament burnout of 12AX7A, V12. This is easily checked for by replacement with a new tube.

d) Presence of positive low level "HV" voltage as compared with that indicated on the "HV" dial, poor regulation and high ripple. (No external load applied to "HV" output).	1) Filament burnout of 12AX7A, V11. This is easily checked by replacement with a new tube. 2) Check voltage across capacitor, C2A for voltage conditions specified on schematic diagram. If far below indicated voltage, check filter capacitor for open circuit. 3) An abnormal increase of reference supply voltage results in reduced power supply "HV" output voltage. High bias supply voltage with associated high reference supply ripple voltage. This may be the result of internal grid-cathode or screen grid short of 6W6-GT, V1. Replace with a new 6W6-GT tube. 4) Burnout of V8, 12AX7A will cause the bias voltage to rise. It will have a similar effect on the "HV" supply but of greater magnitude in the "HV" supply. Therefore the net result of filament burnout of this tube is a rise of "HV" voltage.
e) Apparent satisfactory operation at 200 MA load with rise of ripple voltage at zero external load.	6W6-GT tubes, V2 through V6, exhibit poor cut-off characteristic. To check cut-off characteristic, operate at zero load and low "HV" output voltage. Monitor the "HV" output with a VTVM or high impedance AC voltmeter, Remove one tube at a time until faulty tube is identified. Faulty tube is identified by return to normal of "HV" output ripple voltage. Care should be exercised in handling 6W6-GT tubes to prevent burning of hands due to touching hot glass envelope. In removing 6W6-GT tube depress retaining clamp maintaining this position of the clamp while tube is removed.

f) Apparent satisfactory operation at low current values with supply failure at 200 MA external and 105 line.	1) Faulty 6W6-GT tubes, V2 through V6, will cause remaining 6W6-GT tubes to carry excess load. Tubes should be visually inspected for filament burnout. If burnout is not apparent, then tubes should be checked on a tube checker. 2) Faulty 5R4-GYA, V9, rectifier tube. A similar condition applies to the 5R4-GYA rectifier. If tube drop is excessive under load, then operation at 200 MA and at 105VAC line will be impaired. The tube should be checked in a tube checker, and if faulty, it should be replaced.
g) Apparent instability in power supply voltage, drift of order 1 volt magnitude or greater.	Faulty bias and main amplifier input tubes cause this voltage wandering. The tubes involved are 12AX7A tubes, V11 and V12. One tube should be first replaced and the output voltage monitored. If this condition is not removed, replace the second 12AX7A tube. A schematic diagram of the Power Supply will be found in the rear of this manual. The diagram contains typical operating voltages for a specific set of operating conditions. The pilot light indicator lamps are NE51 neon lamps. They are accessible from the front panel by merely unscrewing the pilot light dome.

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7. MAINTENANCE OF THE POWERSTAT ("HV" CONTROL)

a) DETERMINING DEFECTIVE OPERATION

When the brush contact of the "Powerstat" indicates excessive wear (less than 1/32" of the carbon brush extends from the brush holder) or arcing occurs when the "Powerstat" is rotated with a load on the supply resulting in high noise output from the equipment or hash in RF equipment in the laboratory, the brush contact should be examined. A properly adjusted "Powerstat" should not arc or spark under load when the rotor shaft is turned. If arcing is present, the "Powerstat" should be examined and serviced.

b) SERVICING THE "POWERSTAT"

The "Powerstat" can be easily reached by removal of the cabinet from the Power Supply. If closer examination or adjustment of the powerstat is required, greater accessibility is realized by removal of the front panel. This is accomplished by unscrewing the six large phillips head screws on the front panel. After removing the six screws, draw the panel forward, then tilt it being careful to clear the powerstat from the frame in doing so. The powerstat brush is now free and clear. If wear is indicated, replacement of the brush is effected by loosening the two set screws in the brush holder and removing the holder. Care must be exercised in replacing the holder to insure the new holder very nearly assumes its former position.

c) DIRTY OR PITTED COMMUTATOR SEGMENTS

Dirty or pitted commutator segments may be cleaned with carbon-tetrachloride and/or sanded lightly with fine crocus-cloth. Excessively pitted commutator segments are a result of failure to replace a worn brush or severe overload of a "Powerstat". Replacement of the entire "Powerstat" assembly may be necessary. (See Paragraph 8a) Refer to Lambda Part No. ACR-13-003 when ordering.

8. SERVICE NOTES

a) REMOVAL OF THE "HV" POWERSTAT AND PRECISION POTENTIOMETER ASSEMBLY.

1. Remove the connections to the powerstat and the precision potentiometer. Identify leads to facilitate replacement of entire assembly.

2. Remove the "HV" control knob.

3. Separate the assembly from panel by unscrewing of the four phillips head screws holding the unit to the front panel.

4. Powerstat and precision potentiometer assembly may now be separated from panel.

b) REPLACEMENT OF POWERSTAT OR PRECISION POTENTIOMETER

1. Remove powerstat potentiometer assembly from the equipment as per (a) above.

2. Loosen the set screws holding the flexible coupling between the two units.

3. Loosen the nut securing the powerstat to the bracket and remove the powerstat.

4. Replace the powerstat if required, insuring that at the extremes of rotation of the potentiometer shaft, the powerstat brush takes symmetrical positions with regard to the mounting screw in the rear of the powerstat.

(NOTE: At no time should the stop collar screws of the potentiometer be loosened and the collar moved with regard to the potentiometer shaft. These set screws are set hard and should remain untouched.)

5. If the potentiometer is to be replaced, after removal of the powerstat, loosen the three pan head phillips head screws securing the potentiometer to the bracket. Replace the potentiometer with the new unit. Refer to Lambda Part No.DPT-50-002 when ordering. Before tightening the screws securing the potentiometer to the bracket estimate the center to center distance between the shaft of the potentiometer and the stop screw in the spacer plate. This is best done with a pair of calipers. This distance should approximate 29/64. The powerstat should now be remounted, and the Millen coupling joined to the powerstat and potentiometer shafts. Rotation of the potentiometer should now be tried and the Millen coupling should be adjusted so that at the extreme clockwise and counter-clockwise positions of the shaft, the brush holder of the powerstat should take symmetrical positions with regard to the mounting screw in the rear of the powerstat.

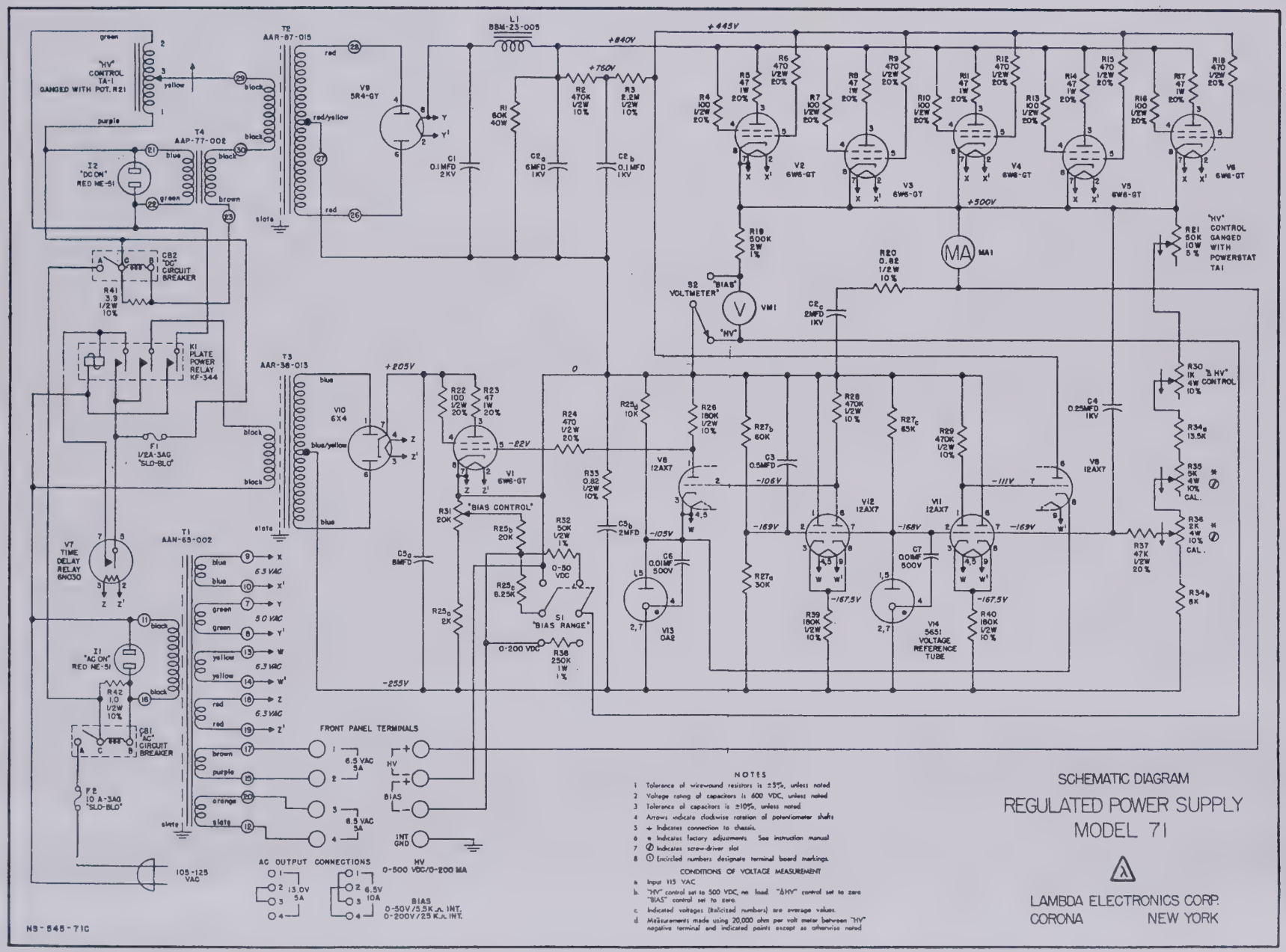
6. Check the assembly for smooth rotation and reassemble into equipment.

b) REPLACEMENT OF THE "VOLTMETER" AND "BIAS RANGE" SWITCHES.

The replacement of either of these switches can be facilitated by removing the panel as outlined above.

SAFETY NOTICE

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. OBSERVE THE USUAL SAFETY PRECAUTIONS WHEN OPERATING OR SERVICING THE EQUIPMENT TO AVOID SEVERE SHOCK OR INJURY.



NOTES

1. Tolerance of wirewound resistors is ±5%, unless noted
2. Voltage rating of capacitors is 600 VDC, unless noted
3. Tolerance of capacitors is ±10%, unless noted
4. Arrows indicate clockwise rotation of potentiometer shafts
5. ⏚ Indicates connection to chassis.
6. ⊕ Indicates factory adjustments. See instruction manual
7. Ⓢ Indicates screw-driver slot
8. ① Encircled numbers designate terminal board markings.

CONDITIONS OF VOLTAGE MEASUREMENT

a. Input 115 VAC
b. "HV" control set to 500 VDC, no load. "ΔHV" control set to zero "BIAS" control set to zero.
c. Indicated voltages (Italicized numbers) are average values.
d. Measurements made using 20,000 ohm per volt meter between "HV" negative terminal and indicated points except as otherwise noted

SCHEMATIC DIAGRAM

REGULATED POWER SUPPLY MODEL 71

LAMBDA ELECTRONICS CORP.
CORONA NEW YORK

NS-545-71C

WARRANTY

We warrant each instrument manufactured by us, and sold by us or our authorized agents, to be free from defects in material and workmanship; our obligation under this warranty being limited to repairing or replacing any instrument or part thereof, which shall, within five years after delivery to the original purchaser, be returned to us with transportation charges prepaid, prove after our examination to be thus defective.

We reserve the right to discontinue instruments without notice, and to make modifications in design at any time without incurring any obligation to make such modifications to instruments previously sold.

MP MASTER
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